

Patent Claims:

1. Radio-frequency filter, in particular in the form of a duplex filter, having the following features:

- 5 - a board or a substrate (1) is provided,
- a continuous line (3) is formed on the board or the substrate (1),
- resonators (9, 19) are provided on the board or the substrate (1), on the opposite side to the continuous line (3),
- 10 - the resonators (9, 19) are arranged offset with respect to one another in the longitudinal direction of the continuous line (3),
- a ground surface (11) is provided, preferably offset parallel to the board or to the substrate (1), with a dielectric preferably being provided between the board or the substrate (1) and the ground surface (11),
- 15

characterized by

20 the following further features:

- the resonators (9, 19) are coupled to the continuous line (3) through a dielectric, preferably in the form of the board or of the substrate (1),
- 25 - at least a portion of at least one resonator (9, 19) is arranged such that, when viewed at right angles to the board or to the substrate (1), at least a portion of one resonator (9, 19)
 - a) overlaps the continuous line (3), or
 - 30 b) is at a very short distance from the continuous line (3), which is less than or equal to the width of the continuous line transversely with respect to its longitudinal direction, and
- the continuous line (3) has at least one line constriction (5a) or at least one broadened line area (5b).
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2. Radio-frequency filter according to claim 1, **characterized in that** at least a portion of at least one resonator (9, 19), preferably at least a portion of the resonators (9, 19), is arranged such that, when
5 viewed at right angles to the board or to the substrate (1), at least a portion of at least one resonator (9, 19) is at a maximum distance from the continuous line (3) which is less than or equal to half the width of the continuous line (3a).
- 10 3. Radio-frequency filter according to claim 1 or 2, **characterized in that**, when viewed at right angles to the board or to the substrate (1), at least a portion of all the resonators (9, 19) overlaps the continuous
15 line (3), or its closest end or section is at a maximum distance from the continuous line (3) which is equal to or less than half the width of the continuous line (3).
- 20 4. Radio-frequency filter according to one of claims 1 to 3, **characterized in that** the at least one line constriction (5a) and/or the at least one broadened line area (5b) is provided between two resonators (9, 19).
- 25 5. Radio-frequency filter according to one of claims 1 to 3, **characterized in that** the continuous line (3) has a line constriction (5a) or a broadened line area (5b) at least with respect to one resonator (9, 19) in the area in which the continuous line (3)
30 overlaps at least one section or one portion of the resonator (9, 19) or is at a minimum distance from the resonator (9, 19) there.
- 35 6. Radio-frequency filter according to one of claims 1 to 5, **characterized in that** the resonators (9, 19) are formed on that face of the board or of the substrate (1) which faces the ground surface (11).

7. Radio-frequency filter according to one of claims 1 to 6, **characterized in that** the resonators (9) are capacitively coupled to the continuous line (3).

5 8. Radio-frequency filter according to claim 7, **characterized in that** the capacitively coupled resonators have at least one stripline section which runs in a straight line and whose longitudinal direction is aligned such that it runs transversely,
10 that is to say preferably at right angles, to the extent direction of the continuous line (3).

9. Radio-frequency filter according to claim 7 or 8, **characterized in that** the width (B1, B2, B3) of the
15 capacitively coupled resonators (9) corresponds in its longitudinal direction to the length of the line constriction (5a) or of the broadened line area (5b) of the line (3), or differs from it by no more than 50%, and preferably by less than 30%.

20 10. Radio-frequency filter according to one of claims 1 to 9, **characterized in that** the bandpass/bandstop response of the RF filter (9) can be adjusted by means of the length (L1, L2, L3) of the
25 respective resonator (9a, 9b, 9c) and/or by means of the extent of the line constriction (5a) or of the broadened line area (5b) and/or by the offset of the respective resonator (9; 9a, 9b, 9c) from the continuous line (3), or by the extent of the overlap
30 between the continuous line (3) and the adjacent end of the respective resonator (9; 9a, 9b, 9c).

11. Radio-frequency filter according to one of claims 1 to 6, **characterized in that** the resonators (9)
35 are inductively coupled to the continuous line (3).

12. Radio-frequency filter according to one of claims 1 to 6 or 11, **characterized in that** the inductively coupled resonators are formed from

stripline resonators with a U-shaped or approximately U-shaped plan view, which are arranged such that their respective central connecting section (19'), by means of which the two limbs (19'') of the at least
5 approximately U-shaped stripline resonators are connected to one another lies at least approximately parallel to the adjacent section of the continuous line (3).

10 13. Radio-frequency filter according to one of claims 1 to 6, 11 or 12, **characterized in that** the width (B1, B2, B3) of the limbs of the stripline resonators is less than the longitudinal size of the line constriction (5a) or broadened line area (5b).

15 14. Radio-frequency filter according to one of claims 1 to 6 or 11 to 13, **characterized in that** the overall width or coupling length (K1, K2, K3) of the resonators (19) is greater than the longitudinal size of the line
20 constriction (5a) or broadened line area (5b).

15. Radio-frequency filter according to one of claims 1 to 6 or 11 to 14, **characterized in that** the bandpass/bandstop response of the RF filter (19) can be
25 adjusted by means of the length (L1, L2, L3) of the respective resonator (9a, 9b, 9c) and/or by the extent of the line constriction (5a) or of the broadened line area (5b) and/or by the offset between the respective resonator (9; 9a, 9b, 9c) and the continuous line (3),
30 or by the extent of overlap between the continuous line (3) and the adjacent end of the respective resonator (9; 9a, 9b, 9c).

16. Radio-frequency filter according to one of claims
35 1 to 15, **characterized in that** a duplex filter is composed of two radio-frequency filter arrangements (9, 19).

17. Radio-frequency filter according to claim 16,
characterized in that one branch of the duplex filter
comprises a bandstop filter with resonators (9) coupled
inductively, and the other branch comprises a bandstop
5 filter with the resonators (19) coupled capacitively.

18. Radio-frequency filter according to one of claims
16 or 17, **characterized in that**, in order to pass a
lower band at a lower frequency, one branch of the
10 duplex filter has an asymmetric bandstop filter with
inductively coupled resonators (9), and, in order to
pass a higher frequency in a higher band, the other
branch has a bandstop filter with capacitively coupled
resonators (19).

15 19. Radio-frequency filter according to one of claims
1 to 18, **characterized in that** the bandpass/bandstop
response of the radio-frequency filter can be adjusted
such that $f_{\text{parallel}} < f_{\text{series}}$.

20 20. Radio-frequency filter according to one of
claims 1 to 19, **characterized in that** the filter or the
bandstop filter is asymmetric.